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ABSTRACT

This study investigated toddlers' reactions to morally related events to determine whether age was a factor in emotional reaction, whether the middle of the second year was a salient time for the emergence of emotional reactions to such events, and whether heart rate change could be used as a new measure of moral responsivity. While their heart rate was being monitored by an electrocardiograph machine, 51 toddlers aged 14 to 21 months were presented with three kinds of morally related events: (1) a prohibition to touch a certain object; (2) a distress cry from the experimenter who pretended to lose something important; and (3) a request to violate a standard, such as a request to spill juice on the floor. Toddlers' emotional responsivity to these events was measured by their heart rate changes, facial expressions, and latency to touch an object presented after the prohibited object. Although no clear relationship between heart rate and other measures of emotional responsivity and no clear age trends were found, those toddlers whose heart rates accelerated after the prohibition were less likely than other toddlers to touch the object that was presented after the prohibited object. Negative affect after the prohibition was expressed in the older age groups significantly more frequently than in the younger groups. (MDM)

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Early Responsivity to Moral Events: Physiological and
Behavioral Correlates?

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Abstract

In the present study, toddlers' emotional reactions to morally-related events were investigated. The researchers asked whether there were age changes in the emotional reaction to moral events, whether the middle of the second year was a salient time for the emergence of emotional reactions to morally-related events, and whether heart rate change could be used as a new measure of "moral" responsivity and would correspond with previously used measures such as negative affect or social referencing. Three kinds of morally-related events were presented to 51 toddlers (ages 14-21 months): a prohibition, a distress cry, and requests to violate a standard. No clear relationships between heart rate and other measures of emotional responsivity and no clear age trends were found. A trend showed, however, that those toddlers whose heart rates accelerated after that prohibition were less likely to touch the control object that followed. Negative affect after the prohibition was expressed significantly more frequently in the two oldest age groups. After 17 months, toddlers' heart rate decreases correlated with age on the distress cry and the control that followed but not on the control that preceded the cry. Also, toddlers were less likely to comply with the requests to violate a standard over the control requests for spilling and throwing, but not for scribbling on a doll.

The study of moral development in toddlers has blossomed over the past 15-20 years, ever since it was discovered that it is within the second year of life, the first signs of moral concern emerge. Dunn and Munn (1986), Hoffman (1975; 1982), Eisenberg (1982), and Zahn-Waxler and Radke-Yarrow (1982) all had shown that one-to-two-year-olds show precursors to empathy; they begin to orient to another's distress, respond with facial cues, and even attempt to comfort others in pain. The second year has also been shown to be a time when toddlers begin to show an awareness of standards (Kagan, 1981); they begin to understand the meaning of the word "no" (Emde, Johnson, & Easterbrooks, 1987; Spitz, 1957), comply with and "internalize" adult prohibitions (Kaler & Kopp, 1990; Kopp, 1982; Kuczynski, L, Kochanska, G, Radke-Yarrow, M., and Girnius-Brown, O., 1987; Vaughn, Kopp, & Yarrow, 1984), and take a special interest in the way things "ought" to be (Dunn, 1987; 1988; Kagan, 1981; 1984; Lamb, 1992; 1993). While most studies document moral awareness and empathically related behaviors increasing over the second year, one study that followed four toddlers longitudinally across the second year, showed that 17-18-months was somewhat of a turning point in the development of moral concern, a time when toddlers showed a peak in moral awareness as measured by behaviors such as the tendency to experiment with and test prohibitions (Lamb, 1993).

Before these behavioral studies were done, research had

concentrated on the more cognitive side of moral development defining the moral person as essentially someone who understands that an act is wrong, someone who understands the feelings of another when that person is distressed, and someone who can take another's perspective.

It was indeed the behavioral observational studies, often done naturalistically in the home, that introduced a different component to moral development, the emotional one, requiring a re-definition of the moral soul as the person who feels horror, outrage, or fear at moral wrongdoing; guilt and shame over one's own transgressions; distress or sadness at the pain of another. It has been suggested that emotions may drive moral behavior in childhood as well as in adulthood, that they may motivate our desire to be good, and that (Kagan, 1984; Kochanska, 1993).

While observational studies have brought to light the emotional nature of moral development, one of the many possible reasons why studies of moral development have not focused on emotion is because of our lack of adequate measures of emotional responsivity. Facial expressions are widely used, however, we can not guarantee that an internal state will be expressed facially. Some studies on adults have suggested an inverse relationship between physiological and facial expressions of emotion; still, physiological measures suffer less from self-presentational biases found in other measures (Eisenberg, Fabes, Bustamanted, & Mathy, 1987). This kind of problem has led some

researchers to supplement use of facial expression and other behavioral measures with physiological measures of emotion, even though there are specific interpretive problems with regard to the relation between emotion and physiology. It has even been suggested that heart rate and other electrophysiological measures be included in all studies of emotional responsivity (Beidel, 1989). The use of heart rate as a measure of emotional responsivity has already shown some promise, especially in the temperament literature (Fox, 1989; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Kagan, Reznick, Gibbons, 1989), and in work on empathy and prosocial responding (Eisenberg, Fabes, Miller and Fultz, 1989; Eisenberg and Fabes, 1990).

Research suggests that heart rate deceleration occurs with attention or surprise (Kagan & Lewis, 1965; Graham & Jackson, 1970; Berg and Berg, 1979; Beidel, 1989) and that the degree of deceleration was directly related to the degree of attending (Lewis, 1974). Heart rate deceleration has also been shown to be associated with "concerned attention" whereas heart rate acceleration was related to "personal distress" (Eisenberg & Fabes, 1990).

Heart rate acceleration, for the most part, has been associated with fear (Schwartz, Campos, & Baisel, 1973), wariness and discomfort (Cacioppo & Sandman, 1978; Ekman & Friesen, 1975) and "defensiveness " (Beidel, 1989; Graham & Jackson, 1970). Acceleration is usually accompanied by a facial response of

sobering or distress. The "negative emotions" (anger and fear) have shown a clear relationship to heart rate acceleration whereas positive emotions (interest and joy) show no such clear relation (Provost & Goin-Decarie, 1979).

Given the relative consistency of the findings regarding the relationship between negative affect and heart rate acceleration, we designed this study to look at negative emotional responses (through facial expression and heart rate acceleration) to moral events. We used heart rate change as a supplemental measure to facial expression to try to understand the emotional underpinnings and changes in moral concern in the second year of life.

We were interested in three questions.

1. Can heart rate acceleration to moral events be used as a measurement of moral awareness? We were particularly interested in acceleration responses given Kagan's (1984) theory that fear and uncertainty may motivate the acquisition of standards, and because our research design would include a prohibition.
2. Given the many findings on age differences in behavioral responses over the second year, would we find age difference in "emotional" responses to moral events?
3. Since earlier studies have found both increases over the second year and also a peak-like formation in morally-related behaviors over the second year, would we in this study find that

the 17-18 month transition was a period in which toddlers were especially sensitive to prohibitions?

METHOD

Fifty-one toddlers and their mothers served as subjects. They volunteered by responding to signs placed at daycare centers and a mailing that was based on birth announcements from a local paper. This mailing requested volunteers for general research in developmental psychology. In order to be able to explore the question with regard to the 17-18-month time period (Lamb, 1993), we selected toddlers to fit into three groups, seventeen 14-16-month-olds, nineteen 17-18-month-olds, and fifteen 19-21-month-olds. With this kind of division there was a weighting of subjects towards the middle of the second year.

In the laboratory, which was decorated to look like a playroom, there was a get-acquainted period where mother, toddler, and experimenter played with toys. One experimenter monitored the EKG machine while the second administered the experimental objects and assisted the child and mother. After the get-acquainted period, the experimenter helped the mother place the child in a high chair and attach the electrodes leading to an EKG machine onto the toddler's back and stomach. There was a 15% refusal rate which was mostly from toddlers refusing to sit in a high chair rather than refusing the electrodes. After the

toddler was accustomed to the electrodes we obtained a baseline reading.

The experiment involved three kinds of moral events and controls for each (see Table 1): a prohibition, a distress cry, and requests to violate a standard. Earlier conceptualizations of moral development as having two major components, empathy and awareness of standards (Gilligan, 1981; Kagan, 1984; Lamb, 1993) have found some research support in the form of two factors derived from a very large survey of mothers of young children (Kochanska, 1993). The distress cry was invented to represent the empathic component to moral development; the prohibition and requests to violate a standard to represent the awareness of standards.

Prohibition The first moral event was a prohibition made by the experimenter who assisted the mother and child earlier. A dish of mud was placed on the tray in front of the child along with other toys and when the child reached for the mud, the experimenter said "No." If the child did not reach for the mud, after 10 seconds, the experimenter would point to the mud and say "No." We had considered having the mother deliver the "No" but chose the examiner instead in an attempt to establish some standardization in the "tone" and "intensity" of the no. Later analyses indicated no differences between the group who reached for the mud and the group who didn't but was told "No" anyway. To measure responsivity to the no, we created two controls to

present before and after the "no". Before the prohibition event, the examiner presented either a cup or a toy chair and said either "here" (for the cup) or "chair" (for the toy chair). The controls were counterbalanced.

Distress Cry Our second "moral" event was a distress cry emitted by the experimenter at the EKG machine who had pretended to lose something important. The controls which preceded and followed this event were matched in length and in their non-verbal quality. One control was an extended "Uh huh, uh huh" pretending interest in something on a computer screen. The other was the humming of a tune. Each control as well as the event was enacted by the two experimenters within a situationally believable scenario. The same experimenter always played the "focus" role.

Requests to Violate a Standard After the above "moral" events, we gave the child three different requests to violate a standard. Each request was typical of a parental prohibition for a one-to-two-year old, and each request was surrounded by two other "control" requests. The first request was to throw play dough across the room; the second was to spill juice on the floor; the third was to color with a marker on a doll. The controls were appropriate actions to take with each material given. The third violation of a standard, to color on a doll, was designed to create a situation of a "flawed" object since previous research (Dunn, 1987; 1988; Kagan, 1981; 1984; Lamb,

1992; 1993) showed this to be a morally-related concern or interest of toddlers. The experimenter modeled each of these acts several times for the child and compliance was coded for "trying" even if the child did not succeed in completing the request.

Measurement of Emotional Responsivity Emotional
responsivity was measured in three ways, through heart rate change scores, facial expressions (affect and social referencing of mother), latency to touch the object presented after the prohibited object, and compliance with the request to violate a standard (and controls). Heart rate change scores were obtained by subtracting the heart rate average obtained from 10 seconds after presentation of the event or control from the ten second heart rate average obtained before the presentation of the event of control. For the requests to violate a standard and control requests for this part of the study, we did not use change scores but instead compared heart rate averages over 10 seconds after each request. Negative affect, social referencing, latency to touch the object presented after the prohibited object, and compliance with requests to violate standards were coded by two independent observers who studied videotapes of the interaction. Percent agreement between coders was 74% for affect, 84% for social referencing, 92% for latency to touch the third object (within a two second margin), and 93% for compliance. Because the reliability for affect coding was only moderate, a third

coder went over the data and made a decision with regard to which code should be used in those situations where there was a disagreement.

Other Measures

In an attempt to explore possible individual differences in emotional responsivity to these events we devised some temperament measures for behavioral inhibition. Kagan and associates (1984; 1989) have shown behavioral inhibition to be a useful term for differentiating temperamental types. Heart rate, among other measures, has contributed to this differentiation. Two scales from the Toddler Temperament Scale (Fullard, McDevitt & Carey, 1984) which seemed most related to behavioral inhibition (adaptability, and approach) were given to mothers after the laboratory session to complete before they left. There were also two behavioral measures administered to the child. A bizarre toy (chattering teeth) was placed on their tray before the experiment began and latency to touch the toy was measured. After the experiment was almost completed, but before the child got out of the high chair. the experimenter emerged from behind a wall wearing a Groucho Marx mask with moving mustache and eyebrows. She then approached the child. Heart rate and facial distress was coded for this act. Finally, the mud was reintroduced to the child just before the experiment was completed and it was noted

whether or not the child touched the mud (thus forgetting or ignoring the previous prohibition).

Results

Heart Rate Change Heart rate changes were looked at as a continuous variable and also dichotomized into increases vs. decreases since previous research had suggested heart rate increases were suggestive of emotional distress.

Heart rate change was not related to behavioral signs of distress such as negative affect nor social referencing. Heart rate change was also not related to age on the prohibition event. This was true even when looking at the subsamples of toddlers who actually had reached for the mud before they were prohibited and those who had been prohibited even though they never reached for the mud. There was a trend showing that those toddlers whose heart rates increased after the prohibition were less likely to touch the control object that followed the prohibition. On the distress event, the two older groups' average heart rates were significantly negatively correlated with age. The older the child (after 16 months), the more the heart rate decreased on the distress event ($r = -.38$, $p = .01$) and on the event following the distress event ($r = -.37$, $p = .01$) but not on the event preceding the distress cry.

Heart rate changes were significantly negatively associated with age on almost all of the requests to violate a standard and their controls.

Behavioral Measures of Emotional Responsivity In terms of the behavioral signs of emotional responsivity, there were no significant age differences in social referencing or latency to touch the control object after the prohibition. A Chi Square revealed a significant age difference in the expression of negative affect after the prohibition ($X^2=10.28$, $p=.005$), with seventeen month-olds and older showing more negative affect than the youngest group. (See Table 2.)

There was no significant differences in compliance for the task aimed at imitating the "flawing" of an object, the coloring on a doll. However, there were significant differences on the request to spill a drink vs. each of its controls (see Figure 1). While 58% of the sample were willing to drink from the cup and 93% were willing to stir the juice in the cup, only 30% were willing to spill the drink. A test of correlated proportions shows this difference to be significant at the $p<.001$ level comparing those willing to stir vs. those willing to spill ($z=5$), and at the $p=.01$ level comparing those willing to drink vs. those willing to spill ($z= 2.56$). With regard to throwing the playdoh, 86% of the sample was willing to push the playdoh and 72% were willing to roll the playdoh, only 56% were willing to throw the playdoh. The difference between pushing vs. throwing was

significant ($z=2.98$, $p<.01$), where as the difference between rolling vs. throwing the playdoh only approached significance ($z=1.52$, $p<.06$). There were no significant differences in the proportion of toddlers willing to color on a doll vs. the two controls. Compliance was not related to age.

Behavioral Inhibition None of the behavioral inhibition measures correlated with one another and so they could not be combined to form a single measure of behavioral inhibition. Nor did any one measure show a relation to any of the measures of emotional responsivity.

Discussion

The results of this study suggest that more work needs to be done before simple measures of heart rate change can be used as a sign of emotional responsivity. Unlike previous studies, none of the behavioral measures of emotional responsivity bore a relation to heart rate change and so lead us to interpret any findings with regard to heart rate change with extreme caution.

Moreover, more typical measures of emotional responsivity do not show a relationship between responsivity and age, except in the case of the prohibition. It was shown to be more likely that toddlers 17 months of age and over will respond with negative affect to a prohibition.

One might argue that this prohibition did not measure moral responsivity at all but instead measured a child's response to negative affect from a stranger. This may be the case, but why would negative affect from a stranger be more potent after 17 months? Research on stranger anxiety suggests it should be the youngest group who would be most fearful of a stranger's negative affect.

It may be that this negative affect shows a developmental change in the understanding of "no" and the anticipation of negative consequences following a prohibition. Or it may reflect the development of the ability to express negative affect. Cicchetti & Schneider Rosen (1986) claim that children's socio-emotional life begins to become more integrated, organized and self-regulated during the second year. Perhaps this is particularly true after 17 months.

The findings with regard to heart rate deceleration show a relationship between heart rate decreases and age for the distress cry and the control event that followed, but only for the two older groups. We are left with two questions, why should there be an age difference at 17 months and after? And why should the amount of heart rate decrease correlate with age. In response to the first question, once again one could argue that there is a turning point in the second year after which toddlers can make sense of, integrate, and organize affect so that their responses are more consistent. In response to the second

question, this finding may support the work of Eisenberg and Fabes (1990) who have shown consistent heart rate deceleration in videos and personal reminiscences meant to evoke sympathetic concern but heart rate accelerations to videos and reminiscences meant to evoke personal distress. In our sample, there were a number of children who showed heart rate decreases accompanied by negative affect (thus preventing finding significant relationships between heart rate increases and negative affect on the prohibition and distress event as predicted). Perhaps heart rate increases would be more related to fear of punishment, suggesting that for some children value acquisition may be based on fear. This interpretation is partially supported by the trend finding that children whose heart rates increased after the "no" were less likely to touch the control object presented after.

Those children whose negative affect was accompanied by heart rate decreases may have been showing "concern", something akin to "attention" which in the physiology literature is always accompanied by heart rate deceleration. These children would possibly reflect a different avenue of value acquisition. Eisenberg and associates (Eisenberg & Fabes, 1990) draw a distinction between "personal distress," "sympathy", and "empathetic sadness." They have also linked heart rate deceleration (and thus, sympathy or empathetic sadness) with prosocial responding. She suggests that the children whose heart rates increase show personal distress and are drawn inward to

take care of themselves, whereas those children whose heart rates decrease exhibit sympathy and are drawn outward, to care for the other.

One interesting finding from this study derived from the requests for a violation. Methodological problems as well as differing socialization histories may have contributed to the differences found in compliance with the requests. One might imagine that spilling a drink, and to a lesser extent, throwing a plaything, are violations that have probably been prohibited several times in a toddler's life. Coloring on a doll may not have ever been prohibited because few toddlers are allowed the use of markers. Moreover, toddlers will most likely see coloring on anything as an act of making something pretty for they have yet to be taught the "artistic" difference between "scribbling" and coloring. Hence, this may not have been the best example to test for interest in or distress over flawing an object. The heart rate decelerations that were related to age on these tasks may actually reflect the concentration and effort spent in the carrying out of the requests which would naturally increase with age as the child's competence and interest in performance increases.

While hypotheses regarding age differences were not borne out in this study, this does not necessarily mean that no age differences exist. There were some methodological problems that may have interfered with a true test of our hypotheses. There

could be a more complex relationship between age differences and individual differences that better measures of temperament or some information regarding socialization history or current parental socializations practices would uncover. Future research might examine toddlers coming from homes with differing caregiver socialization patterns and then look at whether there are different heart rate responses to prohibitions, distress cries, or the request to violate a standard. Future research might also attempt to examine individual differences in toddlers in the acquisition of moral concern over the second year as well as the style in which toddlers respond to natural moral events.

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Table 1

"Moral" Events

	CONTROL	EVENT	CONTROL
PROHIBITION*	"here"	"NO"	"chair"
DISTRESS CRY*	"uh huh"	crying	humming
REQUEST TO VIOLATE			
A STANDARD	1. push playdoh	throw playdoh	roll playdoh
	2. drink juice	spill juice	stir juice
	3. color paper	color on doll	color paper

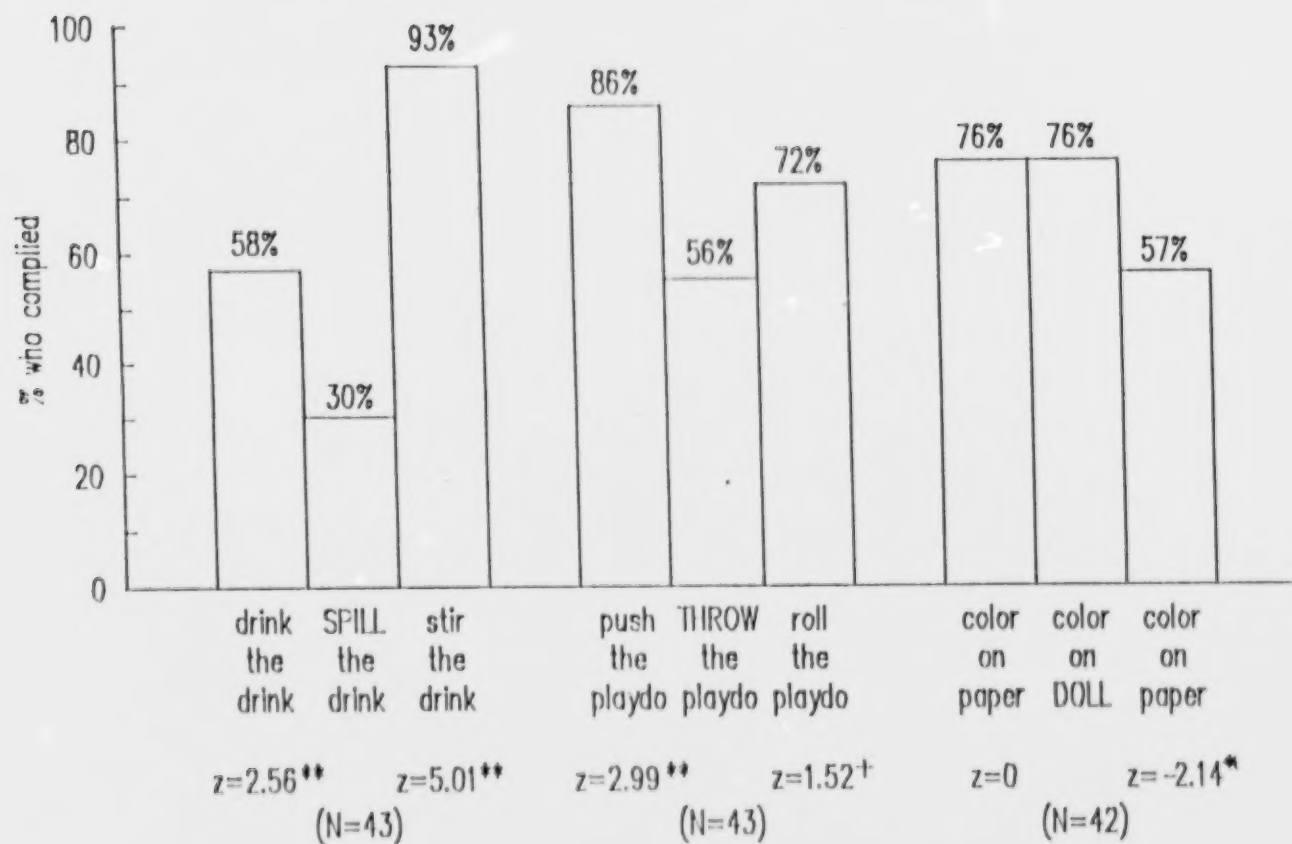
* Controls were counter-balanced for these "moral" events

Table 2

Negative Affect For the Prohibition By Cohort

	COHORT		
	14 months	18 months	22 months
Neutral or			
Positive	14	6	6
Affect			
Negative	3	13	9
Affect			

Figure 1 Percentages of Toddlers Complying with Requests to
Violate a Standard and their Controls



** p < .01, one-tailed

+ p < .07